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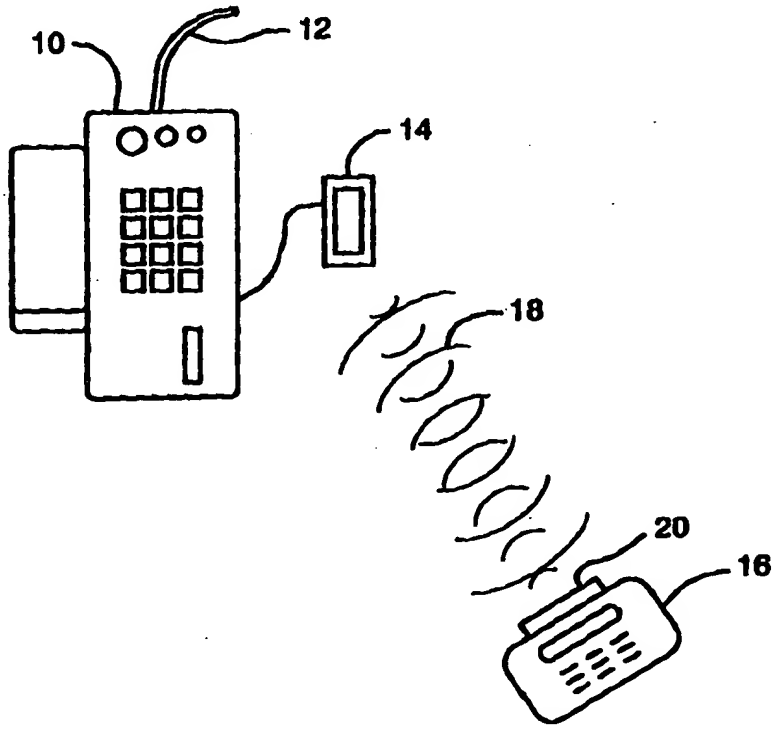
(54) Title: WIRELESS TELEPHONE DATA EXCHANGE SYSTEM

(57) Abstract

A wireless telephone data exchange system includes a computer device (16); a telephone line interface device (12); and a user transducer device (14) interconnected with the computer device (16) and a server transducer device interconnected with the interface device (12) for communicating directly with each other over an energy beam (18) for exchanging data remotely, wirelessly between the computer device (16) and the telephone line interface device (12).



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WIRELESS TELEPHONE DATA EXCHANGE SYSTEM

FIELD OF INVENTION

This invention relates to a wireless telephone data exchange system, and more particularly to such a system which enables direct transfer of data between a telephone line and a computer device.

BACKGROUND OF INVENTION

Portable computers, personal data assistants (PDA's) and pocket electronic organizers frequently contain data or information that is to be transmitted, transferred or updated. This is generally done through wired connections to the telephone network or a computer. Many portable computers now have infrared devices that allow exchanging data with another computer or a peripheral device such as a printer but require a wired connection to transmit data by telephone. Wired connections are inconvenient, frequently fragile, and may be difficult or impossible to obtain in places like airport terminals and hotel rooms.

SUMMARY OF INVENTION

It is therefore an object of this invention to provide an improved telephone data exchange system.

It is a further object of this invention to provide such an improved telephone data exchange system which transfers data between a computer device and telephone line without wired connection.

It is a further object of this invention to provide such an improved telephone data exchange system which can communicate wirelessly, directly with a telephone line or through a telephone or telephone peripheral device.

It is a further object of this invention to provide such an improved telephone data exchange system which is inexpensive, convenient, easy to use and provides a measure of security for the data exchange.

It is a further object of this invention to provide such an improved telephone data exchange system which automatically identifies the caller and the addressee for the data

exchange.

It is a further object of this invention to provide such an improved telephone data exchange system which eliminates the need for a modem in the computer device.

The invention results from the realization that an improved telephone data exchange system which transfers data between a remote computer device and a telephone line wirelessly, directly to a telephone line through a telephone or telephone peripheral device can be effected by equipping a computer device with a user transducer and the telephone line with a server transducer which communicates via an energy beam such as infrared or microwave to recognize and identify the user and addressee and then exchange data over the wireless link.

This invention features a wireless telephone data exchange system including a computer device and a telephone link interface device. There is a user transducer device interconnected with the computer device and a server transducer device interconnected with the telephone line interface device for communicating directly with each other over an energy beam for exchanging data remotely, wirelessly between the computer device and the telephone line interface device.

In a preferred embodiment the computer device may be a portable laptop computer, a personal data system or an electronic organizer, for example. The user transducer device may include a user transmitter/receiver device. The server transducer device may include a server transmitter/receiver device. The energy beam may be an infrared beam. The server transducer device may include a modem and it may include a microprocessor. The computer device may include means for establishing communication with the server transducer, means for establishing the type of transaction for the data exchange, means for identifying the addressee for a data exchange, and means for identifying the user for a data exchange. The means for identifying the type of transaction may include means for recognizing an E-mail transaction, a fax transaction, a local data transaction, and a remote data transaction, for example. The computer device may include means for defining the interchange protocol for the identified type of transaction.

The microprocessor may include means for establishing communication with the user transducer. The microprocessor may also include means for establishing the type of

transaction for the data exchange and for identifying the addressee and the user for the data exchange. The means for identifying the type of transaction may include means for recognizing an E-mail transaction, a fax transaction, a local data transaction and a remote data transaction, for example. The microprocessor may include means for defining the interchange protocol for the identified type of transaction.

DISCLOSURE OF PREFERRED EMBODIMENT

Other objects, features and advantages will occur to those skilled in the art from the following description of a preferred embodiment and the accompanying drawings, in which:

Fig. 1 is a schematic diagram showing a wireless telephone data exchange system according to this invention for a personal data assistant communicating through a telephone peripheral device;

Fig. 2 is a view similar to Fig. 1 showing a portable laptop computer communicating directly with a data port to a telephone line according to this invention;

Fig. 3 is a view similar to Figs. 1 and 2 showing a pocket electronic organizer communicating with a telephone line through a telephone according to this invention;

Fig. 4 is a block diagram of the server transducer according to this invention included in the peripheral device of Fig. 1 and the data port of Fig. 2 and included in the telephone of Fig. 3;

Fig. 5 is a block diagram of the user transducer device according to this invention with which the personal data assistant, portable laptop computer and pocket electronic organizer of Figs. 1, 2 and 3 are equipped according to this invention;

Figs. 6-10 are flow charts of the software employed in the microprocessor of the server transducer device of Fig. 4;

Fig. 6 is a flow chart of the initial connection procedure;

Figs. 7, 8, 9 and 10 are flow charts of the procedure used to exchange data in E-mail transactions, fax transactions, local data transactions and remote data transactions, respectively;

Figs. 11-15 are flow charts used in the computer device of Fig. 5;

Fig. 11 is a flow chart of the initial connection procedure; and

Figs. 12-15 are flow charts of the procedure for exchanging data in an E-mail transaction, fax transaction, local data transaction and remote data transaction, respectively.

This invention is accomplished in a wireless telephone data exchange system using a computer device such as a personal data assistant made by PSION, a handheld computer made by Hewlett Packard, a portable laptop computer made by IBM, a pocket electronic organizer made by SHARP, or a similar computer device. A server transducer device includes typically an infrared transmitter/receiver such as a IBM31T1100 made by IBM; a microprocessor such as a 68HC11, 12, or 16 made by Motorola, a modem such as a SMV144ACW/U made by Rockwell International, and a telephone line interface. There is a user transducer associated with the computer device. It includes an infrared transmitter/receiver such as a IBM31T1100 made by IBM.

The infrared receiver in the server transducer receives the incoming infrared radiation beam, extracts the data from that beam and provides it as a stream of digital information to the microprocessor which then converts it to the proper format for the particular transaction involved and delivers it to the modem for transmission over the telephone line interface. The infrared transmitter/receiver in the user transducer device does the same thing but presents the data in digital form to the computer device which then applies the proper protocols, depending upon the type of transaction to which the data exchange pertains. The computer device in the user transducer device and the microprocessor in the server transducer device converts to or from the proper protocol depending upon whether it is receiving or sending the data in the particular data exchange. The protocols or formats for the data exchanged in the various types of transactions – fax, E-mail, local data from the telephone or telephone line, and remote data from some other data processor more distant on the telephone line are those conventionally used.

There is shown in Fig. 1 a conventional public telephone 10 connected to a telephone line 12 and having as a peripheral device to that telephone line 12 a server transducer device 14 which communicates with a computer device such as a personal data assistant 16 via a radiation beam such as infrared radiation 18 through user transducer

device 20. Alternatively, the communication could be directly to telephone line 12, Fig. 2, with the server transducer device 14 connected directly to the telephone line as shown in Fig. 2, where the computer device now is illustrated as a portable laptop computer 16a, which also includes the user transducer device 20 according to this invention. In another alternative, the server transducer device 14 may be installed in a conventional telephone 22, Fig. 3, and the computer device communicates over radiation beam 18 with a computer device which in this case is illustrated as a pocket electronic organizer 16b that is also equipped with the user transducer device 20 according to this invention. Although there are three different types of computer devices shown in Figs. 1-3, any computer device can be used in this invention. Further, although each of the computer devices in Figs. 1-3 is shown with a slightly different arrangement for connection to the telephone line, any one of them may be mixed and matched with any of the others.

Server transducer 14 generally includes a radiation transmitter/receiver such as infrared transmitter/receiver 24, Fig. 4, the output of which in digital form is delivered to microprocessor 26 during an incoming data exchange. Microprocessor 26 then formats the data in the proper form for the particular transaction taking place and delivers it to modem 28 which present it to telephone line interface 30. The modem may be either a separate device or circuit or may be accomplished through software in the microprocessor. If the exchange is going in the other direction then the input from the telephone line interface is delivered to the modem 28 and then to microprocessor 26 which interprets the format for the particular transaction and converts it to a signal for infrared transmitter/receiver 24 to broadcast to the user transducer device. The user transducer device 20, Fig. 5, includes an infrared transmitter/receiver which is connected to the particular computer device 16. Computer device 16, Fig. 5, formats data to be broadcast and delivers it to infrared transmitter/receiver 20 and receives data from infrared transmitter/receiver 20 and converts it to a form usable by the computer device. Microprocessor device 26 in server transducer device 14 is programmed in accordance with the flow charts of Figs. 6-10. First, the receiver output is read in step 50, Fig. 6. If no signal is detected, the system loops back over line 52 and the receiver output is read again. In certain applications it may be necessary for the server to periodically transmit a signal to initiate communications with the user device. If a signal is detected in step 54,

that signal is synchronized with the received signal in step 56 and a reply is transmitted in step 58. Two-way communications are established in step 60 and the type of transaction desired is determined in step 62.

If the type of transaction is E-mail, then the program receives the dialing numbers from the user's device in step 64, Fig. 7. The credit card number can also be received from the user's device, step 66, and a credit card call is made to the E-mail provider in step 68. Next the call is logged in to the E-mail provider and the password is sent in step 70. The protocol is now converted from the link protocol to the E-mail protocol in step 72. The E-mail is uploaded or downloaded in step 74 and then the call is logged off the E-mail system in step 76, the telephone line is disconnected in step 78, and the communications with the user are terminated in step 80. The system then returns to read the receiver output in step 50, Fig. 6.

If it is determined that a fax type of transaction is desired in step 62, Fig. 6, then the system receives the dialing numbers from the user's device in step 82, Fig. 8, it receives the credit card number from the user's device in step 84, and makes a credit card call to the recipient in step 86. The fax tone from the recipient is recognized in step 88 and a conversion is made from the link protocol to the fax protocol in step 90. The fax is sent in step 92, and then the call is disconnected from the telephone line in step 94 and communications with the user are terminated in step 96, after which the system returns to read the receiver output in step 50 in Fig. 6.

If the desired transaction is a data upload or download of data from a local area, for example, a directory of names and numbers stored right in the telephone or in the local telephone system, then the system authenticates the access rights of the user attempting to extract or add names, addresses and telephone numbers in step 98, Fig. 9, after which the upload or download of the data is made into the phone or local phone system in step 100, and then a communication with the user's device is terminated in step 102.

Should the desired transaction be a data upload/download from a remote device such as another computer or data processor, then the dialing number is received from the user's device, step 104, Fig. 10, and the credit card number is also received from the user's device in step 106. A credit card call is made to the remote device, step 108, and

communications are established with it, step 110. The conversion is made from the link protocol to the data exchange protocol in step 112 and the data is exchanged, step 114. Following this, communications with the remote device are terminated in step 116, the telephone line is disconnected in step 118, the communication with the user's device is terminated in step 120 and the system returns to read the receiver output in step 50, Fig. 6.

The user transducer device operates in a similar manner, as shown by the flow charts of the software used in the user's computer device depicted in Figs. 11-15. The procedure begins with a command input, step 130, Fig. 11, and a message prologue is sent in step 132. If communication is not established, step 134, the system keeps trying in step 135. If after *n* times there is still no communication, then in step 138 the system times out and is done. If the communication is established in step 134, the type of transaction is determined in step 136, that is, E-mail, fax, local data or remote data.

If the transaction is an E-mail type of data exchange, the telephone number is sent in step 138, Fig. 12, and then the credit card number is sent in step 140. An authorization code may also be sent, step 142, and the log-in of the information and password is accomplished in step 144. The files to be transmitted are converted from E-mail protocol to link protocol in step 146 and then the files are sent over the link in step 148. The files are received over the link in step 150 and they are converted from link protocol to E-mail protocol in step 152. If the transaction is complete, that is, if the E-mail is determined to have been sent in step 154, then a log out command is sent in step 156 and communications are terminated in step 158. If the E-mail transmission is not done, the system returns to step 146 and the files are continued to be converted from E-mail protocol to link protocol, and the following steps are executed.

If the transaction is a fax transaction, the telephone number is sent in step 160, Fig. 13, and then the credit card number is sent in step 162 followed by the authorization code in step 164. If it is determined in step 166 that the system is connected, then a conversion is made from the fax protocol to the link protocol in step 168 and the fax is sent over the link 170. If it is determined that no connection was made in step 166, then the system keeps waiting in step 172. If after a certain period of time there is no connection, then the communication is terminated in step 174. If within that period of

time the connection is made, the system returns. After the fax is sent over the link in step 170, communications are terminated in step 176 and the operation is completed.

If a local data transmission was chosen in step 136, Fig. 11, then the authorization code is sent in step 180. The data to be sent is converted to the link protocol in step 182 and then is sent over the link in step 184. The data is received over the link in step 186 and is converted from the link protocol to the local protocol in step 188. Following this, whichever direction is operational, the communications are terminated in step 190.

Finally, if the transaction chosen in step 136, Fig. 11, is a remote data transaction, then the telephone number is sent in step 192, Fig. 15, followed by the credit card number, step 194, and the authorization code in step 196. If a connection is sensed in step 198, then the access codes are sent in step 200, and the data to be transmitted is converted to link protocol in step 202. The data is then transmitted over the link, step 204, and received in step 206. The received data is then converted from link protocol to the file format in step 208. If the transmission is complete so that the sending or receiving of the data is complete in step 210, then communications are terminated in step 212. If they are not complete, the system returns to continue to convert data to be transmitted to the link protocol in step 202. In step 198, if the connection does not occur, the system keeps trying in step 214, and if it is unsuccessful after a period of time, it terminates communications in step 216.

Although specific features of this invention are shown in some drawings and not others, this is for convenience only as each feature may be combined with any or all of the other features in accordance with the invention.

Other embodiments will occur to those skilled in the art and are within the following claims:

What is claimed is:

CLAIMS

1. A wireless telephone data exchange system comprising:

a computer device;

a telephone line interface device; and

a user transducer device interconnected with said computer device and a server transducer device interconnected with said telephone line interface device for communicating directly with each other over an energy beam for exchanging data remotely, wirelessly between said computer device and said telephone line interface device.

2. The wireless telephone data exchange system of claim 1 in which said computer device is a portable laptop computer.

3. The wireless telephone data exchange system of claim 1 in which said computer device is a personal data assistant.

4. The wireless telephone data exchange system of claim 1 in which said computer device is an electronic organizer.

5. The wireless telephone data exchange system of claim 1 in which said user transducer device includes a user transmitter/receiver device.

6. The wireless telephone data exchange system of claim 1 in which said server transducer device includes a server transmitter/receiver device.

7. The wireless telephone data exchange system of claim 1 in which said energy beam is an infrared beam.

8. The wireless telephone data exchange system of claim 1 in which said server transducer device includes a modem.

9. The wireless telephone data exchange system of claim 1 in which said server transducer device includes a microprocessor.

10. The wireless telephone data exchange system of claim 1 in which said computer device includes means for establishing communication with said server transducer.

11. The wireless telephone data exchange system of claim 1 in which said computer device includes means for establishing the type of transaction for the data exchange.

12. The wireless telephone data exchange system of claim 1 in which said computer device includes means for identifying the addressee for a data exchange.

13. The wireless telephone data exchange system of claim 1 in which said computer device includes means for identifying the user for a data exchange.

14. The wireless telephone data exchange system of claim 11 in which said means for identifying the type of transaction includes means for recognizing an E-mail transaction, a fax transaction, a local data transaction and a remote data transaction.

15. The wireless telephone data exchange system of claim 11 in which said computer device includes means for defining the interchange protocol for the identified type of transaction.

16. The wireless telephone data exchange system of claim 9 in which said microprocessor includes means for establishing communication with said user transducer.

17. The wireless telephone data exchange system of claim 9 in which said microprocessor includes means for establishing the type of transaction for the data

exchange.

18. The wireless telephone data exchange system of claim 9 in which said microprocessor includes means for identifying the addressee for a data exchange.

19. The wireless telephone data exchange system of claim 9 in which said microprocessor includes means for identifying the user for a data exchange.

20. The wireless telephone data exchange system of claim 17 in which said means for identifying the type of transaction includes means for recognizing an E-mail transaction, a fax transaction, a local data transaction and a remote data transaction.

21. The wireless telephone data exchange system of claim 17 in which said microprocessor includes means for defining the interchange protocol for the identified type of transaction.

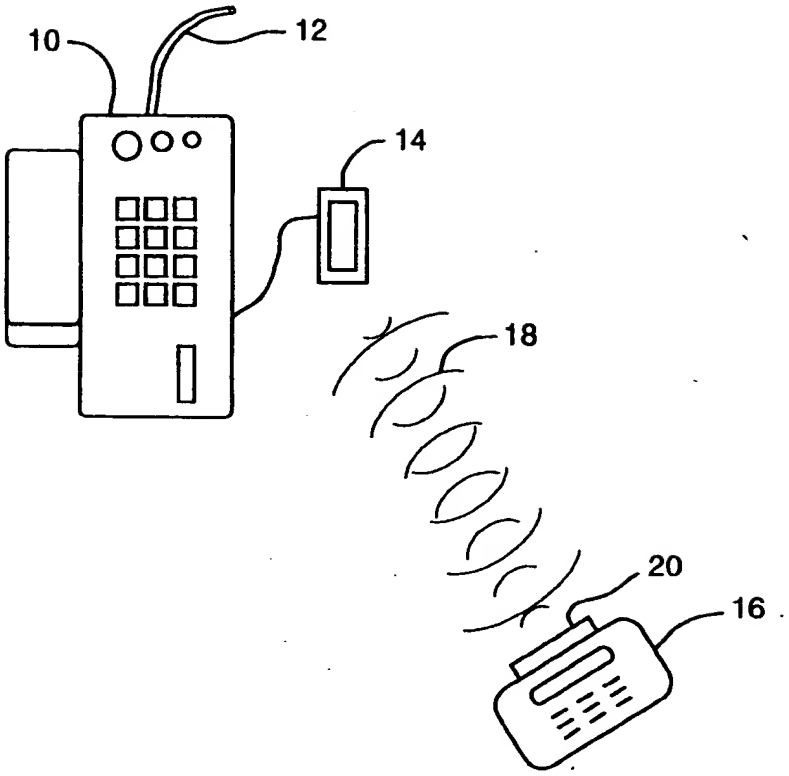

FIG. 1

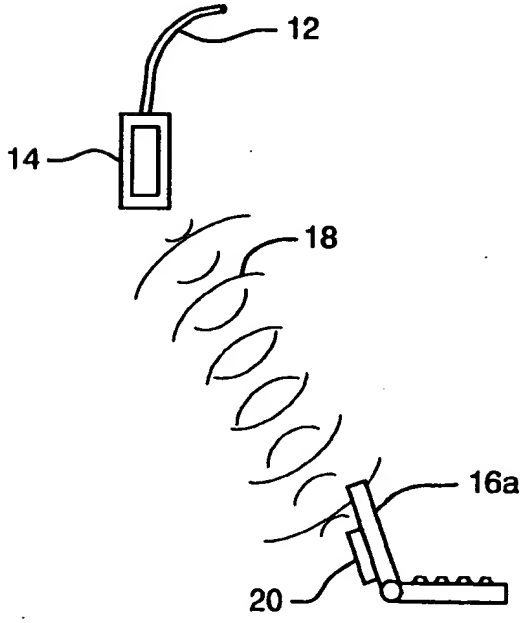

FIG. 2

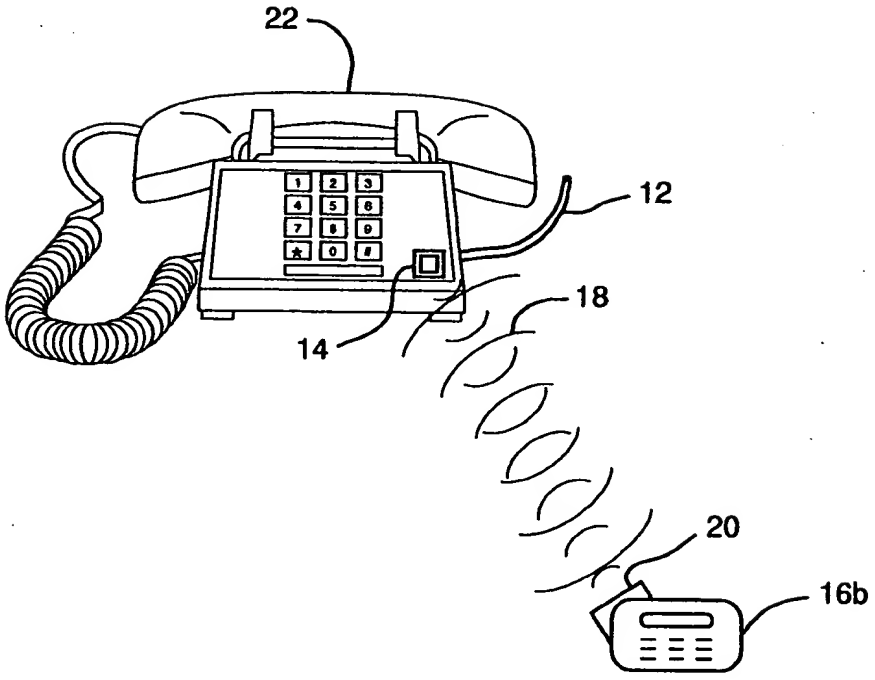

FIG. 3

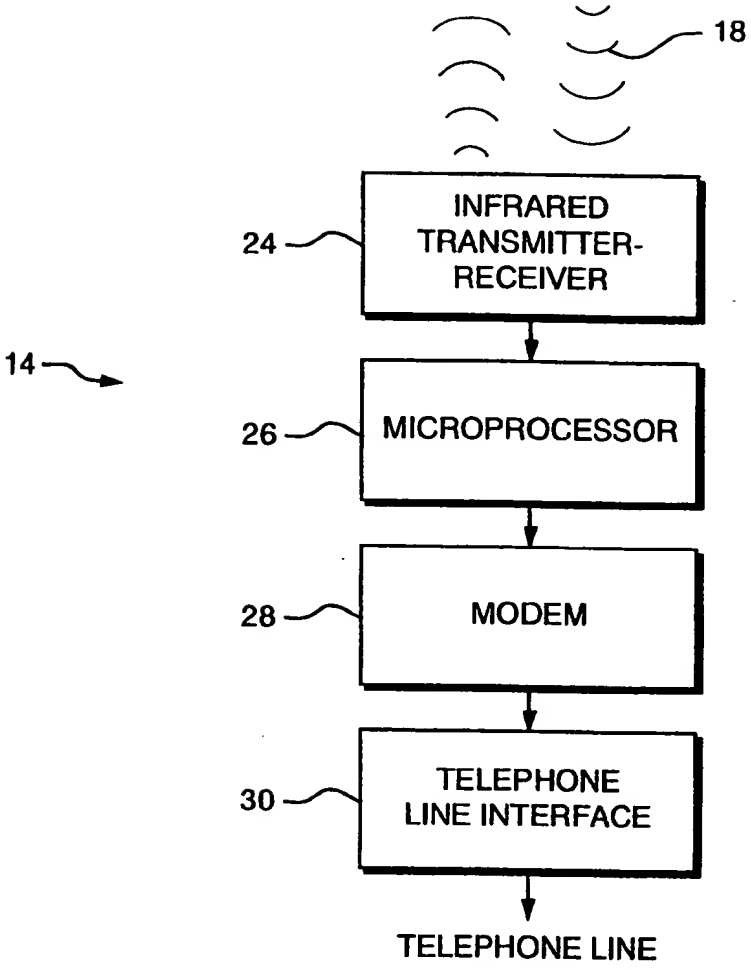
18
INFRARED TRANSMITTER-RECEIVER
24
14
MICROPROCESSOR
26
MODEM
28
TELEPHONE LINE INTERFACE
30
TELEPHONE LINE

FIG. 4

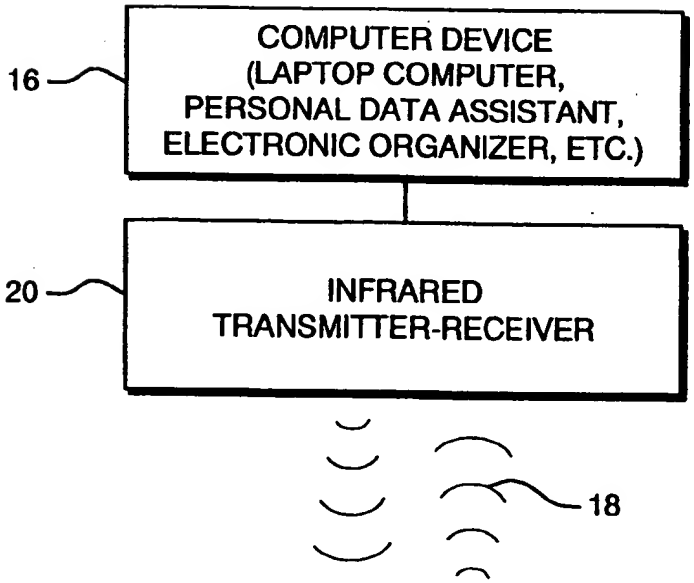
COMPUTER DEVICE (LAPTOP COMPUTER, PERSONAL DATA ASSISTANT, ELECTRONIC ORGANIZER, ETC.)
16
INFRARED TRANSMITTER-RECEIVER
20
18

FIG. 5

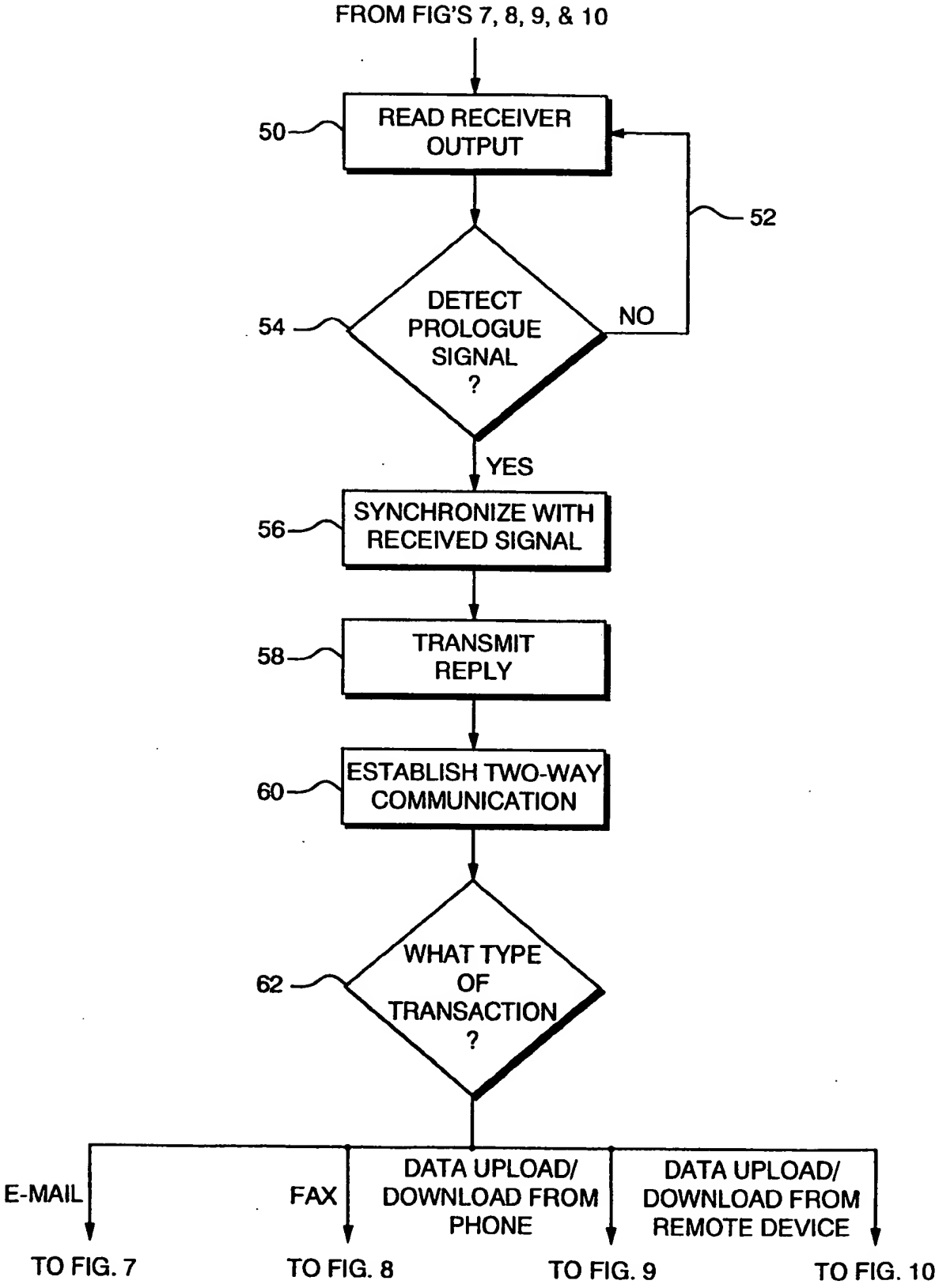
FROM FIG'S 7, 8, 9, & 10
50
READ RECEIVER OUTPUT
52
54
DETECT PROLOGUE SIGNAL ?
NO
YES
56
SYNCHRONIZE WITH RECEIVED SIGNAL
58
TRANSMIT REPLY
60
ESTABLISH TWO-WAY COMMUNICATION
62
WHAT TYPE OF TRANSACTION ?
E-MAIL
FAX
DATA UPLOAD/ DOWNLOAD FROM PHONE
DATA UPLOAD/ DOWNLOAD FROM REMOTE DEVICE
TO FIG. 7
TO FIG. 8
TO FIG. 9
TO FIG. 10

FIG. 6

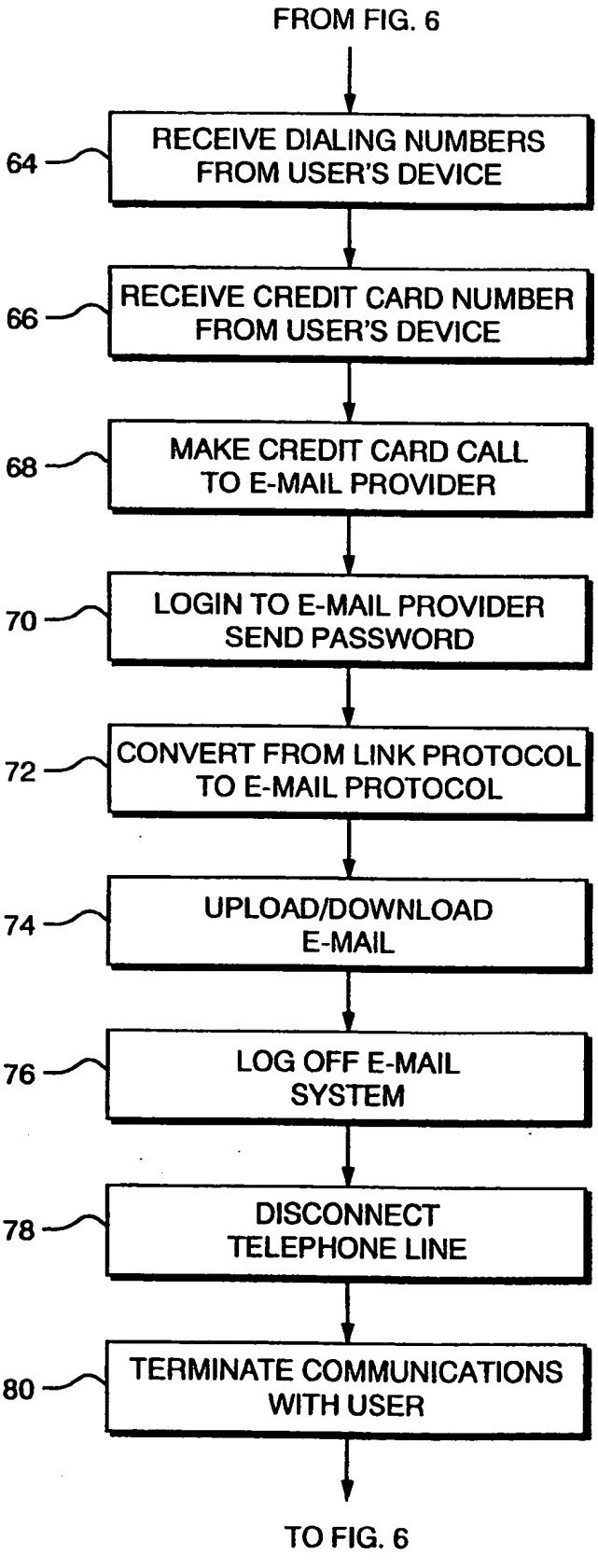
FROM FIG. 6
64
RECEIVE DIALING NUMBERS FROM USER'S DEVICE
66
RECEIVE CREDIT CARD NUMBER FROM USER'S DEVICE
68
MAKE CREDIT CARD CALL TO E-MAIL PROVIDER
70
LOGIN TO E-MAIL PROVIDER SEND PASSWORD
72
CONVERT FROM LINK PROTOCOL TO E-MAIL PROTOCOL
74
UPLOAD/DOWNLOAD E-MAIL
76
LOG OFF E-MAIL SYSTEM
78
DISCONNECT TELEPHONE LINE
80
TERMINATE COMMUNICATIONS WITH USER
TO FIG. 6

FIG. 7

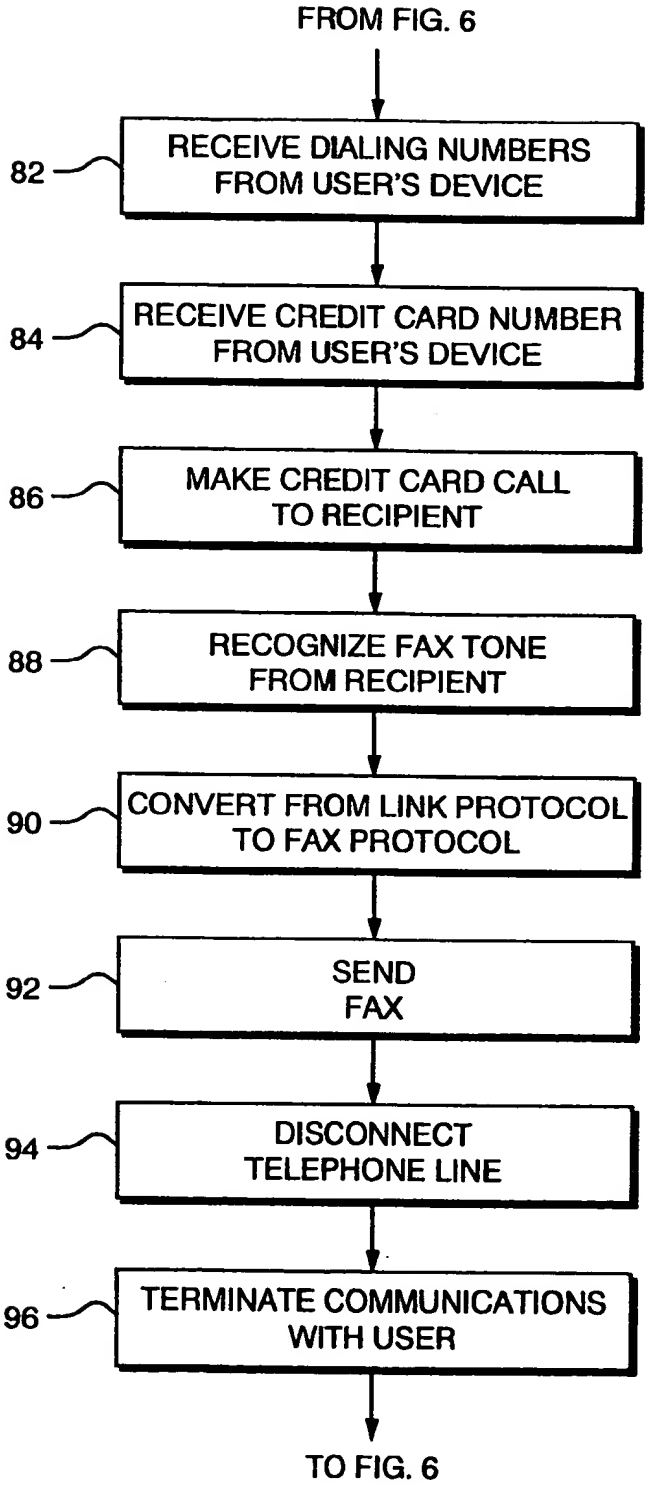
FROM FIG. 6
82
RECEIVE DIALING NUMBERS FROM USER'S DEVICE
84
RECEIVE CREDIT CARD NUMBER FROM USER'S DEVICE
86
MAKE CREDIT CARD CALL TO RECIPIENT
88
RECOGNIZE FAX TONE FROM RECIPIENT
90
CONVERT FROM LINK PROTOCOL TO FAX PROTOCOL
92
SEND FAX
94
DISCONNECT TELEPHONE LINE
96
TERMINATE COMMUNICATIONS WITH USER
TO FIG. 6

FIG. 8

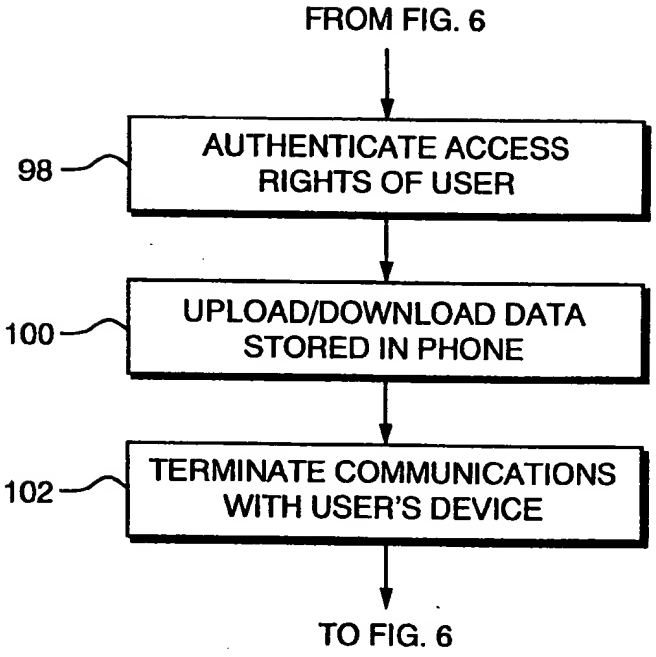
FROM FIG. 6
98
AUTHENTICATE ACCESS RIGHTS OF USER
100
UPLOAD/DOWNLOAD DATA STORED IN PHONE
102
TERMINATE COMMUNICATIONS WITH USER'S DEVICE
TO FIG. 6

FIG. 9

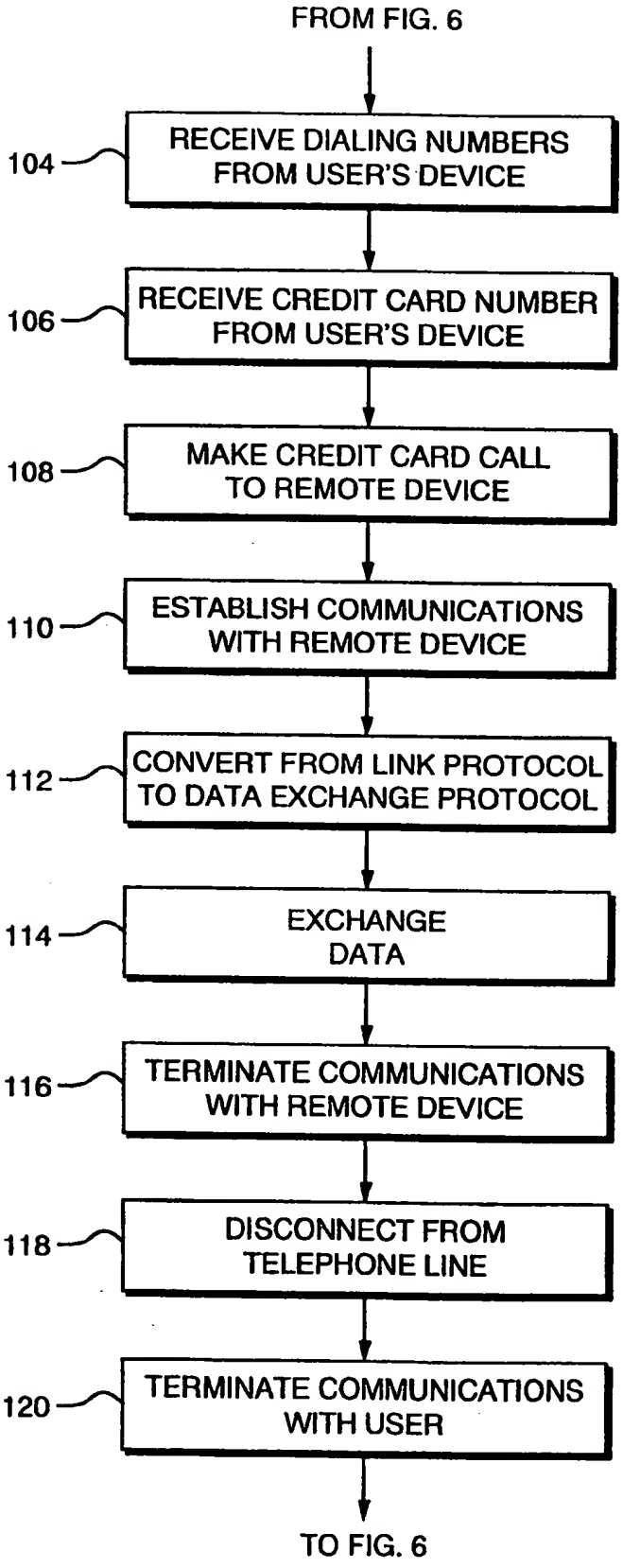
FROM FIG. 6
104
RECEIVE DIALING NUMBERS FROM USER'S DEVICE
106
RECEIVE CREDIT CARD NUMBER FROM USER'S DEVICE
108
MAKE CREDIT CARD CALL TO REMOTE DEVICE
110
ESTABLISH COMMUNICATIONS WITH REMOTE DEVICE
112
CONVERT FROM LINK PROTOCOL TO DATA EXCHANGE PROTOCOL
114
EXCHANGE DATA
116
TERMINATE COMMUNICATIONS WITH REMOTE DEVICE
118
DISCONNECT FROM TELEPHONE LINE
120
TERMINATE COMMUNICATIONS WITH USER
TO FIG. 6

FIG. 10

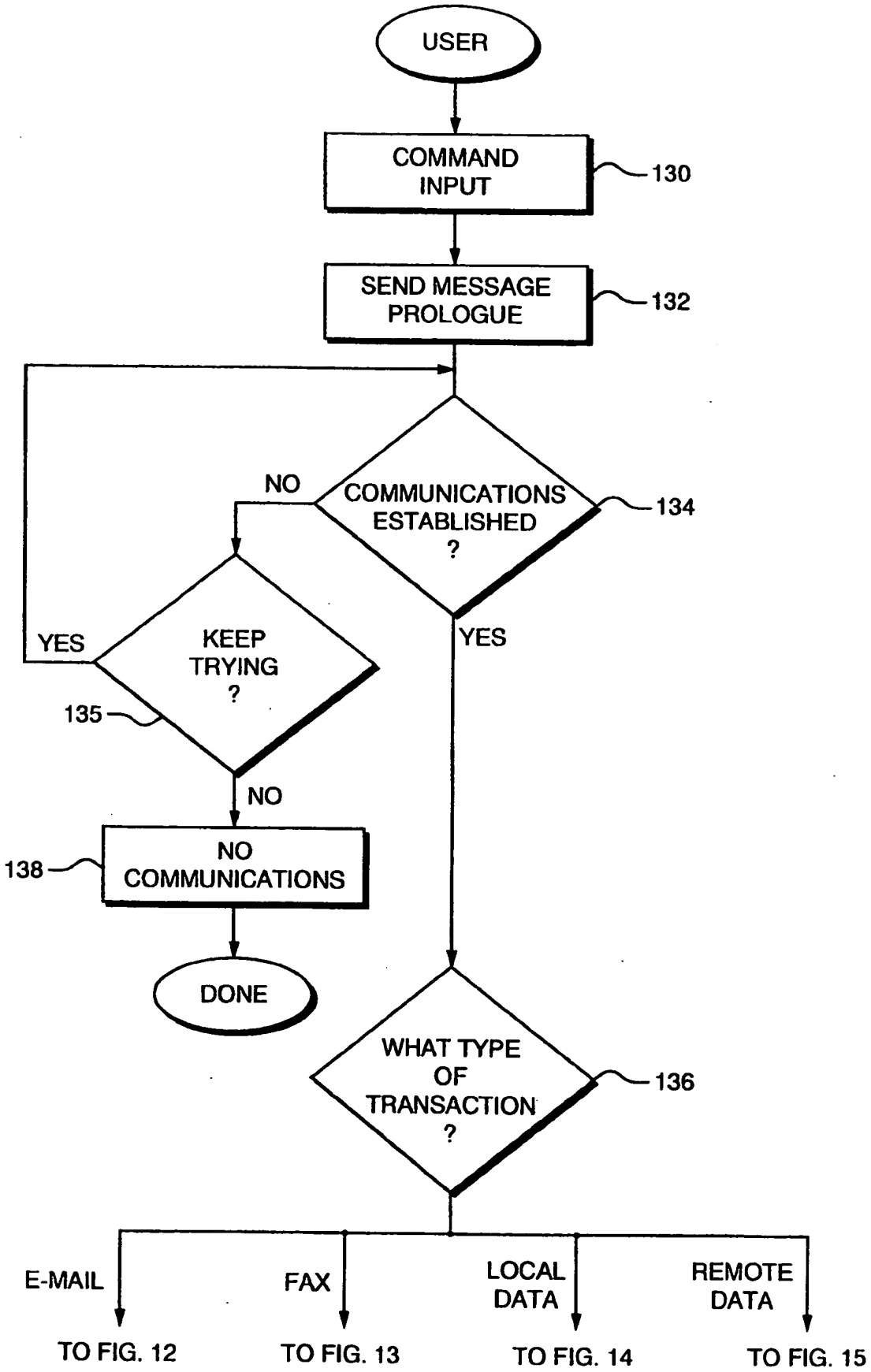
USER
COMMAND INPUT
130
SEND MESSAGE PROLOGUE
132
COMMUNICATIONS ESTABLISHED ?
134
NO
YES
KEEP TRYING ?
135
YES
NO
NO COMMUNICATIONS
138
DONE
WHAT TYPE OF TRANSACTION ?
136
E-MAIL
FAX
LOCAL DATA
REMOTE DATA
TO FIG. 12
TO FIG. 13
TO FIG. 14
TO FIG. 15

FIG. 11

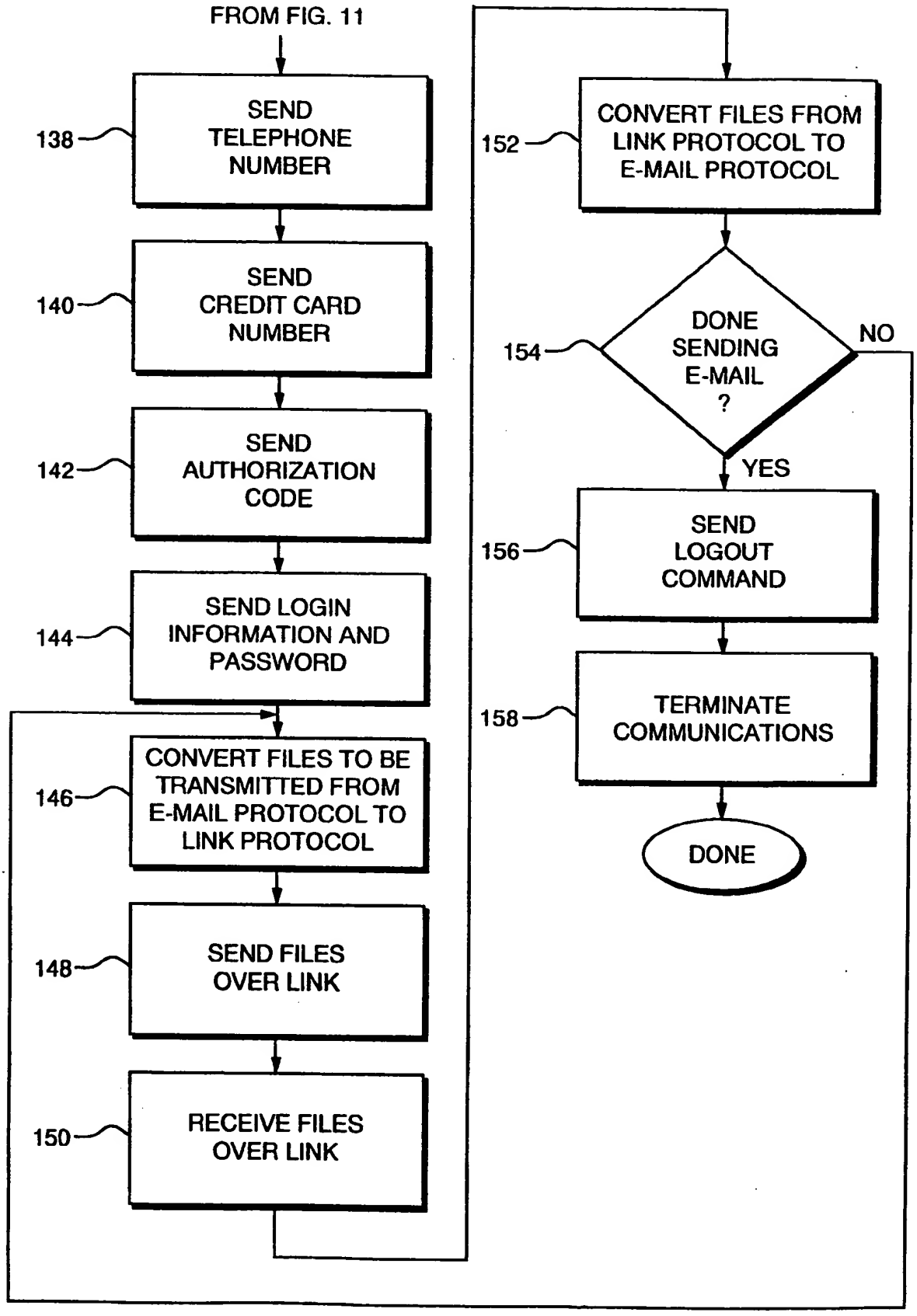
FROM FIG. 11
138
SEND TELEPHONE NUMBER
140
SEND CREDIT CARD NUMBER
142
SEND AUTHORIZATION CODE
144
SEND LOGIN INFORMATION AND PASSWORD
146
CONVERT FILES TO BE TRANSMITTED FROM E-MAIL PROTOCOL TO LINK PROTOCOL
148
SEND FILES OVER LINK
150
RECEIVE FILES OVER LINK
152
CONVERT FILES FROM LINK PROTOCOL TO E-MAIL PROTOCOL
154
DONE SENDING E-MAIL ?
NO
YES
156
SEND LOGOUT COMMAND
158
TERMINATE COMMUNICATIONS
DONE

FIG. 12

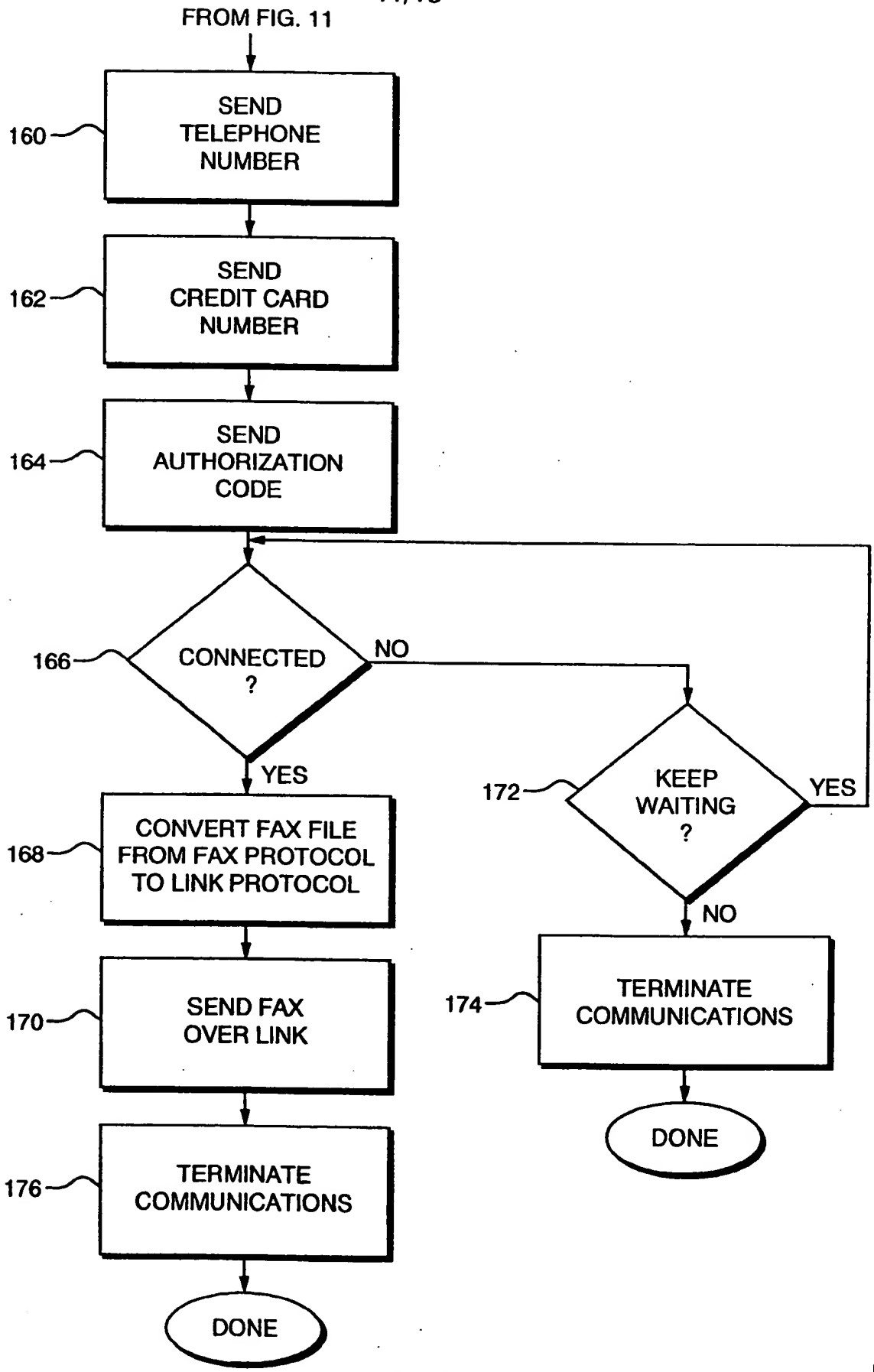
FROM FIG. 11
160
SEND TELEPHONE NUMBER
162
SEND CREDIT CARD NUMBER
164
SEND AUTHORIZATION CODE
166
CONNECTED ?
NO
YES
172
KEEP WAITING ?
YES
NO
168
CONVERT FAX FILE FROM FAX PROTOCOL TO LINK PROTOCOL
170
SEND FAX OVER LINK
174
TERMINATE COMMUNICATIONS
DONE
176
TERMINATE COMMUNICATIONS
DONE

FIG. 13

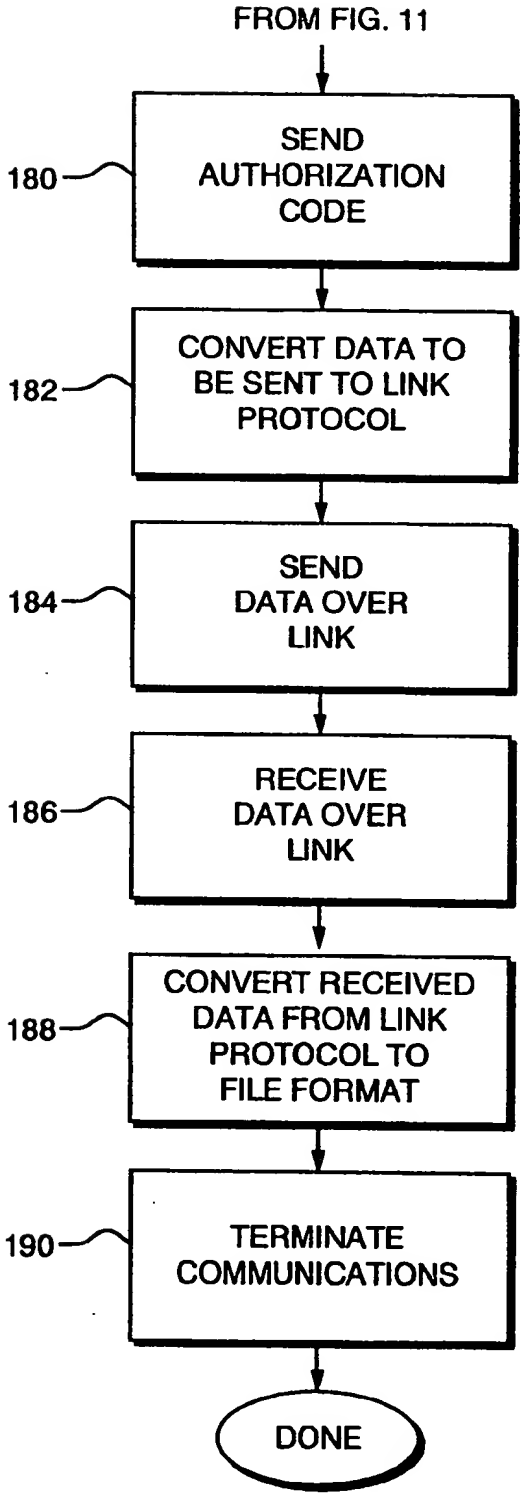
FROM FIG. 11
180
SEND AUTHORIZATION CODE
182
CONVERT DATA TO BE SENT TO LINK PROTOCOL
184
SEND DATA OVER LINK
186
RECEIVE DATA OVER LINK
188
CONVERT RECEIVED DATA FROM LINK PROTOCOL TO FILE FORMAT
190
TERMINATE COMMUNICATIONS
DONE

FIG. 14

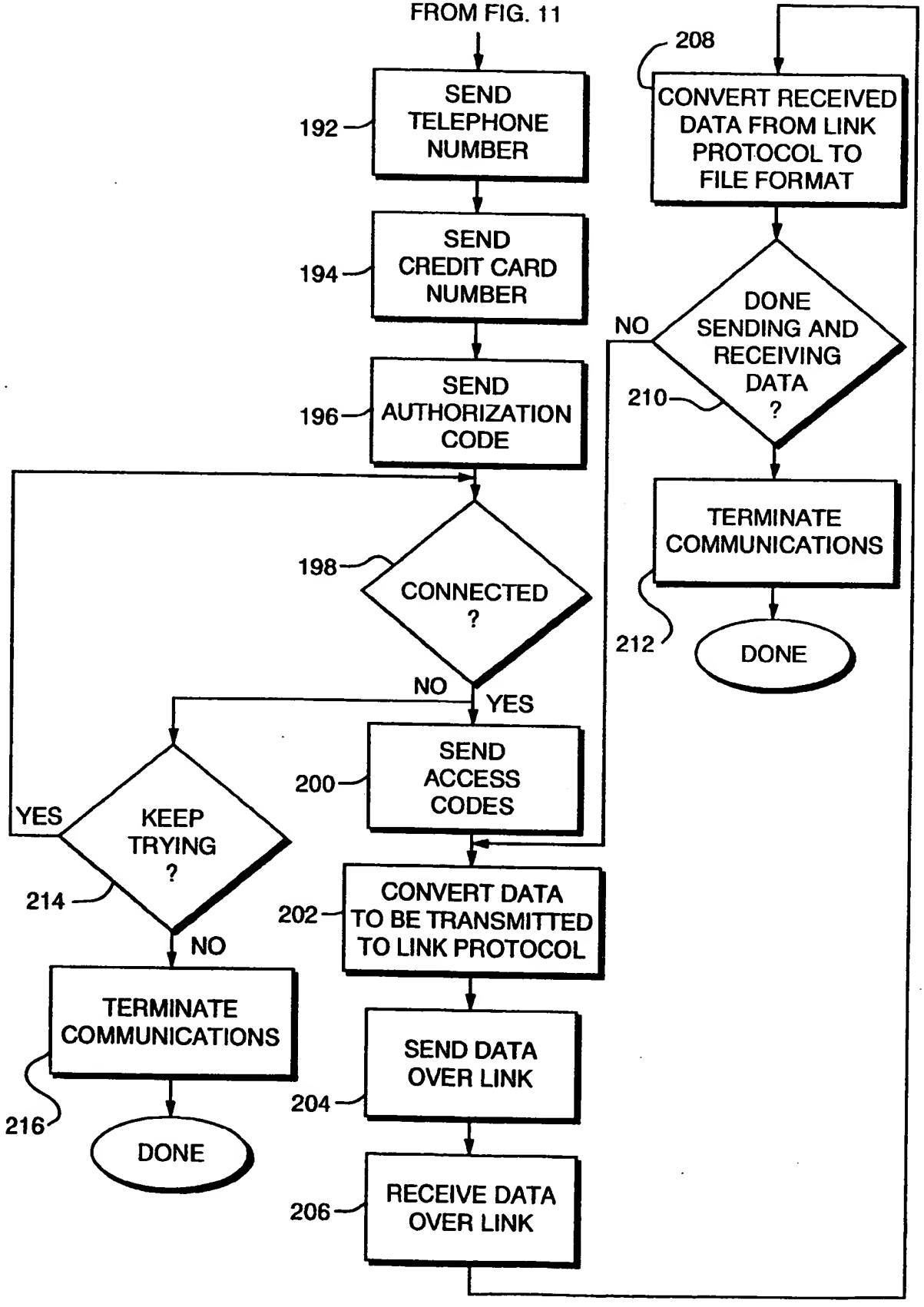
FROM FIG. 11
192
SEND TELEPHONE NUMBER
194
SEND CREDIT CARD NUMBER
196
SEND AUTHORIZATION CODE
198
CONNECTED ?
NO
YES
200
SEND ACCESS CODES
202
CONVERT DATA TO BE TRANSMITTED TO LINK PROTOCOL
204
SEND DATA OVER LINK
206
RECEIVE DATA OVER LINK
208
CONVERT RECEIVED DATA FROM LINK PROTOCOL TO FILE FORMAT
210
DONE SENDING AND RECEIVING DATA ?
NO
TERMINATE COMMUNICATIONS
212
DONE
YES
214
KEEP TRYING ?
NO
TERMINATE COMMUNICATIONS
216
DONE

FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/06765

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04B 1/38
US CL : 455/556

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 455/556,426,507,555,556,557,461,462; 379/352,93.08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

none

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

none

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,673,308 A (AKHAVAN) 30 SEPTEMBER 1997, SEE ABSTRACT	1-21
A	US 4,661,659 A (NISHIMURA) 28 APRIL 1987, SEE ABSTRACT	1-21
A	US 5,353,337 A (TSUMURA ET AL.) 04 OCTOBER 1994, SEE ABSTRACT	1-21
A	US 5,457,742 A (VALLILLEE ET AL.) 10 OCTOBER 1995, SEE ABSTRACT	1-21
A	US 5,493,609 A (WINSECK JR. ET AL.) 20 FEBRUARY 1996, SEE ABSTRACT	1-21

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date		
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search 20 JUNE 1998	Date of mailing of the international search report 01 SEP 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer MARSHA D. BANKS-HAROLD Telephone No. (703) 305-4700

Form PCT/ISA/210 (second sheet)(July 1992)*